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NOTE

**Productivity and beyond: mastering the Polish
genitive inflection***

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ABSTRACT

This study charts the development of the genitive masculine inflection, one of the most irregular parts of the Polish case-marking system. 72 Polish children aged from 2;3 to 10;8 participated in a nonce word production experiment testing their ability to supply the genitive form and their sensitivity to the semantic factors determining the choice of ending. Results indicate that productivity, or the ability to supply the inflected form of some nonce words, emerges early: 78% of the two-year-olds were able to inflect at least one test item. However, mastery, or the ability to consistently supply the correct ending, takes considerably longer to develop, and adultlike levels of provision are not reached until about age 10;0.

INTRODUCTION

Most research on grammatical development focuses on the period from the emergence of a particular grammatical structure to the point when the child's productive abilities are similar to those of the adult. There is comparatively little work on what happens AFTER the child achieves behavioural

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mastery, i.e. reliably supplies the target form, the implicit assumption being that, once children consistently produce adultlike structures, the relevant parts of their mental grammars have reached a steady state and cease to change.

This assumption is in fact known to be false, as demonstrated by research conducted by Bowerman (1982*a*; 1982*b*), Karmiloff-Smith (1992), and others on ‘U-shaped development’, which shows that periods of relatively accurate performance are sometimes followed by periods of increased errors, which in turn are succeeded by more adultlike behaviour. There is also a large body of research (comprehensively reviewed in Tomasello, 2000 and 2003) showing that while young children may produce structures which sound fairly mature, the grammars underlying these structures are very different from adult grammars, and much more lexically specific.

This paper will present further evidence that adultlike spontaneous speech does not necessarily indicate adultlike competence, using an example from morphology – specifically, genitive case marking in Polish. The Polish genitive has three main markers, *-a*, *-u*, and *-y/-i*, all of which are sometimes accompanied by stem changes of varying degrees of regularity (see Orzechowska, 1998 for details). The single most important factor determining the choice of ending is gender, which in most cases can be reliably predicted from the phonological form of the nominative.¹ Feminine nouns nearly always take *-y* or its variant *-i* (with the choice being determined by very general phonotactic rules). Neuter nouns and animate masculine nouns usually take *-a*. Inanimate masculine nouns take *-a* or *-u*, and are the most irregular part of the system and the main focus of this study.

There are no reliable rules determining the choice of ending for inanimate masculine nouns, although there are some broad regularities (see Westfal, 1956; Bodnarowska, 1962; Kottum, 1981). Some of these are semantic: for instance, nouns designating substances, collections of objects, large immovable objects, locations, and abstract concepts usually take *-u*, while nouns designating body parts, tools and other small easily manipulable objects ‘prefer’ *-a*. Others are morphological: some derivational suffixes (e.g. *-acz*, *-ak*, *-arz*, *-nik*, *-ec* and the diminutive *-ek*) are strongly associated with *-a* and others (e.g. *-ot*, *-izm*) with *-u*. And some are phonological: *-u* is extremely rare with stems ending in a palatalized consonant, but preferred with nouns that end in certain other consonants or consonant clusters (e.g. *-m*, *-st*, *-sz*, *-ft*, *-zg*). It is important to note, however, that most of these criteria are not very reliable, and they are often in conflict – for example, a noun designating a location might contain the diminutive suffix. In some such cases, the morphological criterion wins (e.g. *ogródka*

[1] The vast majority of masculine nouns end in a consonant; most feminine nouns end in *-a*; and neuter nouns nearly always end in *-o*, *-e*, or *-ę*.

‘garden-DIM-GEN’, cf. *ogrodu* ‘garden-GEN’) while in others it is the semantics (*domku* ‘house-DIM-GEN’).²

There are also several classes of exceptional nouns. Masculine nouns ending in [a], the offset characteristic for the feminine gender, decline like feminines. Deadjectival nouns (including many surnames) take the adjectival endings *-ego* or *-ej*. Finally, a small number of nouns (less than 1%) are not inflected at all (not just in the genitive, but in other cases as well).³ This class includes initialisms ending in a vowel sound, some borrowings, and a few baby-talk words. Nearly all of these nouns are non-canonical in one way or another.⁴ Some, like *guru*, *etui*, and *attaché*, have an unusual phonological structure (in native Polish words, the stress always falls on the penultimate syllable, and no native noun ends in *-u* or *-ui* in the nominative). Some are assigned to one gender on the basis of their meaning, but sound like words belonging to another gender: for example, *tse-tse* and *mate* sound like neuters, but are assigned feminine gender (probably because their Polish hypernyms are feminine); *jam session* and *katharsis*, in contrast, have typically masculine offsets but are assigned feminine gender. Finally, there are words which have the right phonological properties but the wrong meaning, as it were. These include the masculine noun *boa* and feminines such as *pepsi* and *whisky*. There is in fact a sizeable group of masculine nouns ending in [a] and feminines ending in [i] which inflect in the normal way; however, all of these refer to human males and females respectively, while the indeclinable nouns refer to inanimate objects. Because of their non-canonical nature, such nouns cannot be assimilated to any existing templates and are left uninflected.

In spite of this complexity, research on spontaneous speech indicates that the genitive inflection is apparently acquired very early. Dąbrowska (2001) found that children begin to use correctly inflected nouns in grammatical contexts which require the genitive between 1;4 and 1;7, and reliably supply the correct ending from about 1;9–1;11, which suggests that they become productive with the genitive inflection before age 2;0. This appears

[2] Several Polish grammars state that *-u* is used more often with words of foreign origin. However, the difference is very small: the ending is used with about 42% of borrowings and 36% of native nouns. Moreover, it seems to be a consequence of the fact that the non-native vocabulary contains a relatively high proportion of abstract nouns (which usually take *-u*) and relatively few nouns associated with ‘*-a*-loving’ suffixes: when these confounds are controlled for, the differences disappear (see Westfal, 1956).

[3] This and all other estimates of lexical frequencies in the adult lexicon are based on a random sample of 500 nouns drawn from a medium-sized corpus-based contemporary dictionary (Bańko, 2000).

[4] However, foreign proper names, especially those which are not likely to be well-known to Polish speakers, are often left uninflected even when they resemble Polish words. This is probably functionally motivated, since adding an ending usually requires phonological adjustments which may make the unfamiliar word difficult to recognize.

to be supported by the fact that all the children in the study occasionally overgeneralized the endings. Such errors, however, are surprisingly rare, accounting for 0.5–3.3% of the explicitly marked genitives during the period from the emergence of the genitive until age 5;0. Smoczyńska (1985) also reports that the genitive singular is mastered early and that overgeneralization errors are infrequent.

This study examines the acquisition of the genitive inflection using a different methodology: a nonce word production task. Its main purpose is to investigate the nature and extent of children's productivity with the two masculine endings, and to determine how these develop between the ages of 2;6 and 10;4. A second question which it addresses is whether children are sensitive to the referential factors bearing upon the choice of ending, specifically, the strong association of *-a* with nouns designating small objects and *-u* with nouns designating substances. The latter is one of the most reliable predictors of the choice of masculine ending: about 80% of masculine nouns designating objects take *-a* and 80% of substance nouns take *-u*. Sensitivity to the distinction would help explain the very low overgeneralization rates observed in naturalistic studies; lack of sensitivity would force us to look for other explanations for children's overwhelmingly accurate performance.

METHOD

Participants

Participants were 72 children (37 boys and 35 girls) in four age groups: 2;3–2;9 (mean 2;6), 4;3–4;9 (mean 4;6), 6;3–6;10 (mean 6;7), and 10;1–10;8 (mean 10;4), 18 in each age group. Two additional children (both girls) also participated in the experiment but were not included in the analysis because they failed to understand the task (see below). The children were recruited from a crèche, a kindergarten, and a primary school in the Gdańsk area. All were native speakers of Polish.

Materials

The materials included four unfamiliar substances differing in consistency, colour and smell and four unfamiliar objects (a toy punch, a paper crinkling device, a novelty kitchen implement, and a squeaking tube). The substances were presented in identical transparent containers which were opened during the presentation to make it clear that the nonce word referred to the contents rather than the container. 10 familiar objects (all referents of feminine nouns) were also used as practice items and fillers.

The unfamiliar objects and substances were presented as referents for eight masculine-sounding nonce words. The following nonce words were

used in the experiment: *kuch, gamap, figon, flors, narot, grask, sor, sulom*. These were drawn from a longer list pre-tested with a group of eight-year-olds, who were asked to give a real word that resembled the nonce word. Nonce words which were associated with the same real word by more than 50% of the children were not used in the experiment; this was done to reduce the likelihood of the children relying on purely lexical analogies in the experimental task. All eight words had the phonotactic structure of real Polish words (although they came from relatively sparsely populated phonological neighbourhoods), with offsets typical for masculine nouns. They all rhymed with real nouns which take the usual case endings, and hence could be easily accommodated in the inflectional paradigms of the language.

Procedure

The stimuli were divided into two blocks, each containing four masculine test items (two designating objects and two designating substances) and three familiar feminine nouns acting as fillers. There were two versions of the experiment. Nouns used to designate substances in version 1 referred to objects in version 2 and *vice versa*. Half of the participants were assigned to version 1 and half to version 2.

The children were tested individually in a quiet room at their crèche, kindergarten or school by two experimenters. The first experimenter interacted with the child, while the second kept a log of the child's responses and audio-recorded the testing session for later checking. The two-year-olds were tested in two separate sessions, one block per session. The older children were tested in a single session with a brief break between blocks. Each block consisted of a training phase and a testing phase.

Training phase. The experimenter produced a bag and looked inside, asking, for example,

Gdzie jest figon?
'Where is the figon?'

On finding the object or substance, the experimenter took it out of the bag and showed it to the child, producing the word in a presentational construction. This was followed by a simple definition, e.g.

Zobacz, to jest figon. Figon to taki czerwony płyn.
'Look, this is figon. Figon is a red liquid like this.'

The child was then asked to imitate the word,

Potrafiysz powiedzieć 'figon'?
'Can you say 'figon'?'

and was prompted again if he/she did not respond:

Powiedz 'figon'.

'Say 'figon'.'

When the child succeeded in imitating the word, the experimenter repeated it one more time and then pointed out an interesting property of the substance or object and invited the child to explore it.

Tak, figon, bardzo dobrze! Ten figon bardzo ładnie pachnie. Chcesz go powąchać?

'Yes, figon, very good! This figon smells very nice. Do you want to smell it?' (The experimenter hands the container to the child.)

Finally, the experimenter mentioned the interesting property again:

Ładnie pachnie ten figon, nie?

'It does smell nice, this figon, doesn't it?'

A similar procedure was used with the remaining nonce words in the block, and then the child was given a recognition test in which he/she was asked to pick out each of the novel items from an array of seven (the referents of the four novel masculine nouns and three feminines which were used as fillers in the testing phase):

Pokaż mi, gdzie jest figon?

'Show me where the figon is.'

The experimenter provided feedback to the child, thus offering further learning opportunities:

Tak, to jest figon!

'That's right, that's the figon.'

Nie, to nie figon. To jest sulom. A gdzie jest figon?

'No, this isn't the figon. That's a sulom. Where is the figon?'

Thus the children heard each nonce word 7–8 times in the presentation phase and 2–4 times in the recognition phase.

Testing phase. The genitive inflection was elicited using a 'hiding game'. The experimenter produced a toy and said *Jest X!* 'Here's the X!' (lit., 'Is X!'). The child's task was to hide the toy in a bag and say *Nie ma X-GEN* 'The X is gone!' (lit., 'Isn't X!'). If the child's response was simply *Nie ma* 'Gone', the experimenter asked *Nie ma czego?* 'What is gone?' in order to elicit the genitive. If the child did not respond at all, he/she was prompted with the first two words of the sentence (*Nie ma...*), and then with the first two words followed by first syllable of the test item (or the first two syllables for longer words). Thus, the child was given three chances of producing the target form; on the last attempt, he/she merely had to supply the final

syllable of the test item. The game is based on a common routine, so most children were already be familiar with it.

The testing phase began with 2–4 practice items (all familiar feminine nouns); these were followed by the four test items and fillers presented in random order.

After the experiment, the protocols were checked against the audio recording and a few corrections were made. The children's responses were coded as follows. Gender-appropriate responses were coded as target-*a* or target-*u*, depending on which ending the child used (both were considered correct because both are used with inanimate masculine nouns). Errors were divided into three categories: feminine (use of the feminine ending -*y/-i*), zero (failure to inflect the noun), and other (e.g. failure to respond or an irrelevant response such as substitution of a familiar noun for the nonce noun). Mispronunciations and other distortions of the stem were disregarded: that is to say, the child was given credit for producing the correct form if he/she added a gender-appropriate ending to a distorted stem; distortions of the bare stem were treated as zero errors; and a distorted stem followed by a feminine ending was classified as a gender error.

RESULTS

Emergence of productivity

Two of the youngest children failed to produce any relevant responses: they simply repeated the experimenter's prompts, including those that contained word fragments. Since they had clearly not understood the task, the data for these children were not included in the analysis, and two additional children were tested to ensure an equal number of participants in each age group. (Note that these children's responses could not be coded as 'zero', since they did not produce the nominative form of either the test words or the feminine fillers, but merely repeated the first syllable or syllables after the experimenter.)

All the remaining children supplied the target form with the feminine fillers on at least two trials, showing that they have understood the task. The mean number of target responses to the real-word stimuli ranged from 87% in the youngest group to 99% in the ten-year-olds. Most of the non-target responses were simply failures to respond at all: when they attempted to produce the relevant word, the two-year-olds were correct 96% of the time, and the older children were virtually always correct. Thus, performance on real word fillers was similar to levels of provision in spontaneous speech reported in the literature.

The data on the number of children in each age group who were able to inflect at least one unfamiliar word are presented in Table 1. As we can see, 78% of the two-year-olds and 94% of the four-year-olds showed some

TABLE 1. *Percentage of children at least minimally productive with the masculine endings (N=18)*

Age	-a	-u	at least one
2;6	78	22	78
4;6	72	89	94
6;7	50	89	100
10;4	67	83	100

TABLE 2. *Responses types (in %) by age group*

Age	-a (S.D.)	-u (S.D.)	Total target (S.D.)	Zero (S.D.)	Femin. (S.D.)	Other (S.D.)
2;6	38 (29)	4 (9)	42 (31)	37 (31)	11 (13)	10 (19)
4;6	26 (30)	51 (31)	77 (33)	19 (26)	0 (0)	4 (10)
6;7	25 (34)	51 (39)	76 (30)	21 (27)	2 (5)	1 (10)
10;4	29 (38)	59 (34)	88 (15)	11 (14)	1 (3)	0 (0)

productivity with at least one of the masculine endings, confirming that the ability to apply the genitive inflection productively develops early. Furthermore, the pattern of responses in the youngest group suggests that -a becomes productive earlier than -u. 22% of the two-year-olds were productive with both endings; 56% were productive with -a only; and none were productive with -u only. The earlier emergence of -a is readily explainable as a type-frequency effect. About 70% of the masculine noun types in the input to two-year-olds are nouns which take -a; thus, it seems that children generalize -a earlier because they hear it with more nouns.⁵

Finally, it is worth noting that there were vast individual differences in performance, particularly among the youngest children, where the proportion of target responses ranged from 0% to 100%. These differences are not related to age differences within the group: the mean age of the four children who were not productive with either ending (2;7) is actually slightly above the group mean (2;6).

Subsequent development

Table 2 summarizes the number of -a, -u, zero, feminine, and other responses to the nonce words in each age group. Since there were large differences in variance for feminine and -u responses, the data were analysed using

[5] This estimate is based on the Marysia corpus, which comprises 30 hours of spontaneous conversation with a two-year-old girl living in the Gdańsk region.

nonparametric tests. Age-related differences were analysed separately for each response type using the Kruskal-Wallis test; if a significant difference was found pairwise comparisons between all age groups were carried out using the Mann-Whitney test. All reported significance levels have been corrected for multiple comparisons.

Although 78% of the two-year-olds were productive with at least one of the two endings, they only supplied them 42% of the time. Performance improved slowly with age, and by 10;4, the children produced a target form in 88% of the trials. This level of performance approaches that of adults, who supply the correct genitive form of nonce nouns 94–97% of the time (Dąbrowska, 2004; Dąbrowska & Szczerbiński, unpublished data). Thus, while productivity (the ability to supply the inflected form of at least one unfamiliar word) emerges early, mastery (the ability to consistently supply the required form) takes considerably longer to develop.

The increase in the proportion of gender-appropriate responses is attributable solely to the rise in the productivity of *-u*. As we can see from the table, the number of *-a* responses varied little between age groups, and statistical analysis confirmed that the differences are not significant ($\chi^2=2.89$, $df=3$, $p=0.409$). In contrast, there is a sharp rise in the number of *-u* responses between the ages of 2;6 and 4;6. The differences between groups are fairly large ($\chi^2=25.81$, $p<0.001$) and attributable entirely to the differences between the two-year-olds and the older children (all significant at $p<0.001$; no other comparisons were significant). The most likely explanation for this sudden shift is the development of productivity with *-u*. As indicated above, *-a* appears to become productive earlier, presumably because it is the more frequent ending overall. However, most inanimate nouns take *-u*, and hence most children switch to *-u* as the preferred ending once they are able to use it productively.

The most common error involved zero-marking, i.e. use of the nominative instead of the genitive. Such errors accounted for 37% of the responses given by the two-year-olds and gradually declined to just over 11% in the oldest group. The effect is unlikely to have arisen by chance ($\chi^2=8.53$, $df=3$, $p=0.036$); however, pairwise comparisons indicate that the only significant difference is that between two- and ten-year-olds ($p=0.040$).

Finally, age effects were also found in the use of the feminine ending, *-y/-i*, with the masculine nonce words ($\chi^2=22.95$, $df=3$, $p<0.001$). In this case, the only significant differences were between the two-year-olds and the older children. Even in the two-year-old group, however, such errors were fairly infrequent, accounting for just over 11% of all responses. Thus, the results show that sensitivity to gender as a determinant of the choice of ending develops very early. Further research will be necessary to determine whether this sensitivity is based on awareness of agreement patterns or simply on phonological properties of the noun. (As pointed out in the

TABLE 3. *-a responses as a proportion of all target responses in the Object and Substance conditions*

Age	Object (s.d.)	Substance (s.d.)
2;6	46 (31)	62 (48)
4;6	43 (42)	26 (36)
6;7	20 (30)	37 (46)
10;4	35 (36)	38 (44)

introduction, the gender of Polish nouns can be fairly reliably predicted from the phonological form.)

Sensitivity to referential properties of the noun

Sensitivity to the referential properties of the noun was analysed by comparing the number of *-a* responses as a percentage of all target responses in the Object and Substance conditions. This measure factors out zero and feminine responses, making comparisons across age groups more meaningful. The descriptive statistics are given in Table 3. The results were analysed using a split-plot ANOVA with referent type as the within factor and age as the between factor. There was no effect of referent type ($F(1, 68) = 0.21$, $p = 0.651$) and no interaction of referent type and age ($F(3, 68) = 1.92$, $p = 0.134$), showing that the children's performance was not influenced by the referential properties of the noun. The effect of age approached significance ($F(3, 68) = 2.64$, $p = 0.056$). This is attributable to the older children's tendency to use *-u* more often (see above).

Interestingly, it seems that children ARE sensitive to another semantic factor, namely animacy. As indicated earlier, most two-year-olds use only *-a* with inanimate nonce nouns, presumably because they are not productive with the other ending. The older children, however, gave significantly more *-u* responses ($t(55) = 3.233$, $p = 0.002$). On the other hand, another, as yet unpublished study which used animate referents revealed that children overwhelmingly prefer *-a* with the latter, using it in 97% of their gender-appropriate responses. This difference in readiness to use the semantic cue might be attributable to animate/inanimate distinction being intrinsically more salient than the substance/object distinction, or the fact that the former plays a significant role in other parts of the declension system as well (Orzechowska, 1998).

Discussion and conclusions

We have seen that productivity with the genitive inflection begins to develop early: 78% of the two-year-olds and 94% the four-year-old

participants were able to apply the target inflection to at least one novel noun. However, it takes much longer for children to learn to reliably apply the correct inflection to unfamiliar words. The two-year-olds in this study used one of the gender-appropriate endings in approximately 40% of the opportunities. The proportion of correct responses increased very slowly during childhood, reaching adultlike levels about the age of 10;0.

By far the most common type of error in all age groups was zero-marking, that is to say, use of the unmarked nominative form. Unmarked nouns were almost as frequent at target responses among the two-year-olds, and declined very gradually, accounting for about a quarter of the responses produced by the six-year-olds and 11% of the responses in the ten-year-old group. The slow disappearance of zero-marking errors raises some interesting questions. It is often taken for granted that once children are able to supply the inflected forms of at least some nonce words, they have become productive with the relevant inflection, that is to say, they have 'learned the rule'; a two-year-old's rule is assumed to be the same as that used by an adult. While researchers studying the emergence of productive use have often noted that young children rarely supply the correct form 100% of time, such failures are usually regarded as performance errors – either difficulties in accessing a poorly entrenched routine or more general 'processing limitations'. However, neither of these explanations is very satisfactory. The entrenchment hypothesis may offer a plausible account of the observed behaviour of the two-year-olds, but applying it to the older children is simply begging the question, given that children hear the genitive form of a masculine noun once every two or three minutes.⁶ An account in terms of processing limitations is even less convincing. As explained in the Method section, the children were given three trials for each nonce word; on the final trial, they only had to supply the final syllable of the nonce word which they had just heard in the nominative – hardly a very demanding task.

If the children's inconsistent use of the genitive inflections cannot be explained in terms of performance, we must look for competence explanations: in other words, we must seriously consider the possibility that young children's 'rules' might be different from those used by more mature participants. One possibility, inspired by Langacker's work (see e.g. Langacker, 2000) is that the earliest generalizations that learners extract are phonologically-based low-level schemas rather than general rules that apply across-the-board. A learner equipped with such 'rules' would be able to inflect an unfamiliar word if it matched one of the low-level patterns; otherwise it would be left uninflected. Later in development, learners would normally extract higher-level schemas, which would be generalizations over

[6] In the adult utterances in the Marysia corpus, genitive masculine forms occurred approximately 14 times per hour.

the low-level patterns acquired earlier. The final outcome would be a network of schemas of varying degrees of generality. Normal everyday language use would normally rely on the more entrenched low-level schemas, but speakers could access the more abstract patterns when they had to inflect a word which did not match any of the local templates.

To many researchers – particularly linguists, who are trained to think that the only good rule is a general rule – such an account may seem implausible and unnecessarily complex. There is, however, some independent evidence for it.

As pointed out in the introduction, non-canonical nouns, i.e. nouns which are phonologically unusual or have the wrong ending for their gender or the ‘wrong’ meaning, are usually not inflected for case at all. There are two ways of capturing this fact in the grammar. One is to formulate very general rules for each gender, and then draw up a list of systematic exceptions (e.g. nouns ending in [u] in the nominative, nouns ending in a stressed vowel, feminine nouns ending in [i] which do not refer to human females, etc.). Alternatively, one can provide an inventory of fairly specific schemas or templates which capture all the ‘normal’ cases: one for masculine nouns with a normal stress pattern ending in a palatalized consonant, another for nouns ending in a velar consonant, and so on. Since such rules would apply to a given word only if it matched the template, the various non-canonical forms discussed above would be left uninflected. There are two reasons for favouring the latter solution. First, specific templates of this kind are necessary anyway for some groups of nouns which require stem changes. The advantage of describing the entire system in such terms is that it allows a very simple explanation of why the non-canonical nouns do not inflect: they do not inflect precisely BECAUSE they are non-canonical, and hence do not fit any of the established patterns. Secondly, such an account would also explain how learners avoid overgeneralising rules to words that do not inflect.⁷

Additional support for the idea that children might be using phonologically specific low-level schemas comes from an experiment suggesting that in some cases even mature speakers rely on such schemas – even when the system could be described more elegantly in terms of a single abstract rule. Dąbrowska (2004) found that while Polish adults nearly always provided the correct dative form of morphologically simple masculine and feminine nonce nouns, they were able to supply the correct dative inflection with morphologically simple neuters less than 47% of the time. However,

[7] Polish-speaking children rarely inflect child-invented words or onomatopoeic forms used as nouns, both of which tend to be phonologically non-canonical. The Kraków children (see Smoczyńska, 1998) inflected such nouns only about 1.7% of the time even when marking rates on other nouns were close to 100%.

performance improved dramatically when they were confronted with neuter nonce words containing certain derivational affixes. In other words, Polish adults appear to have fully general rules for producing the dative form of masculines and feminines and a much more specific rule (or rather, a collection of specific rules) for neuter nouns. Dąbrowska argues that the reason for this is the peculiar structure of the neuter class, in which most nouns are clustered in a few very densely populated 'neighbourhoods' defined by shared derivational affixes. In the course of acquisition, learners extract low-level schemas for such clusters of forms; however, there are not enough nouns outside these clusters (or not enough clusters) to force them to generalize further and consequently, most Polish speakers never develop a fully productive schema for the neuter class as a whole.

But if robust general rules only develop in middle or late childhood (and in some cases not at all), how is it that children usually supply the correct form of familiar nouns in naturalistic settings? Most of the words in the children's vocabularies come from densely populated phonological neighbourhoods, and hence, unlike the nonce words used in this study, can be inflected using local templates of the kind postulated above. Furthermore, many inflected forms of familiar words are probably retrieved from memory as ready-made units. We saw earlier that even ten-year-olds did not seem to be able to exploit one of the simplest and most reliable predictors of the choice of ending for inanimate masculine nouns: the fact that nouns designating small objects and substances are strongly associated with *-a* and *-u* respectively. Thus, unless they are able to use some other cue correlated with referential status, their correct use of the genitive masculine inflections in naturalistic contexts must depend to a considerable extent on memorized forms. The fact that children usually supply the correct form in spite of the fact the system is quite irregular also suggests that they store large numbers of inflected forms.

Thus, it is possible to get by with a collection of lexically-specific representations and low-level generalizations over sets of phonologically similar items. The obvious question to ask at this point is why children bother to learn general rules at all. One possibility is that rules act as a back-up system for memory: in other words, language users apply them when they cannot retrieve a ready-made inflected form. This account would be in the spirit of the dual mechanism theory advocated by Marcus, Brinkmann, Clahsen, Wiese & Pinker (1995), who argue that rules apply as a default whenever memory representations cannot be accessed. It would, however, entail an important redistribution of the workload between the two mechanisms: rules would now have to be conceived as an emergency system which speakers resort to when everything else fails rather than the normal way of supplying the correct inflection (*cf.* Bybee, 1995). An alternative view, more in line with 'usage-based' models such as Langacker's

(2000) and Bybee's (1995), would postulate that rules begin life as 'passive' generalizations which capture redundancies in the lexicon, such as the fact that certain aspects of form are consistently associated with a particular function or set of functions. As such, their primary role would be an organizational one: they facilitate the retrieval of stored forms and the piecemeal acquisition of further exemplars (since it is easier to memorize structured material). However, as they became entrenched through frequent use, they eventually become strong enough to be used to inflect novel words. On this view, then, productivity would be a by-product of the way information is stored in the mental lexicon.

The results reported here suggest that children may be using local schemas rather than general rules even when they reliably supply the correct form in spontaneous speech. This is a controversial hypothesis and the evidence discussed above, while suggestive, is clearly far from conclusive. However, one of the merits of the hypothesis is that it makes several predictions which can be easily tested. First, if failure to supply an inflected form is due to unavailability of a compatible schema, learners should fail on the same nonce words if they are retested after a suitable interval (say, 3–4 weeks). Secondly, confronted with sets of phonologically similar nonce words, learners should consistently succeed or fail with words belonging to the same set. The problem, of course, is how to define phonological similarity; but as a first approximation, the following definition should do: phonologically similar words are words which have the same syllable structure (e.g. CVCVC) and a shared final syllable or final consonant cluster. A third prediction is that performance should be better on nonce words which resemble real words from 'crowded' neighbourhoods (i.e. neighbourhoods which contain many phonologically similar words) than on nonce words which resemble only a few real words. This is because type frequency is a major determinant of productivity (*cf.* Bybee, 1995), and hence local schemas should emerge earlier where there are many similar words belonging to the same category. By far the most crowded neighbourhoods in Polish children's noun lexicons are those defined by the three most productive diminutive suffixes (*-ek*, *-ka*, and *-ko*), since diminutives are very frequent in speech addressed to children. Thus, the prediction is that children should perform better on diminutive-sounding nonce words than on non-diminutives. Further research will be necessary to determine whether these predictions are borne out.

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